PUTTING PEOPLE AT THE HEART OF AIR QUALITY MANAGEMENT

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Summary
This paper will present an overview of a range of work that has focussed on developing a new paradigm for air quality management. This will not only argue that developing a more social approach to air quality management is both desirable and necessary, but also how it is possible.

Introduction
One of the key reasons why efforts to improve air quality have not been more successful across Europe has been the failure to elicit more political support at both national and local levels. This can be seen as being due, in no small part, to a failure to capture sufficient public engagement to create the democratic mandate for significant action on air pollution. This has happened for a number of reasons. Partially, the ‘successful’ development of legislation through the Air Quality Framework and Daughter Directives and subsequent EU and national policies, has led to a set of numeric ‘μg/m³’ limit and target values that, whilst based on health evidence. In turn this has led to approaches to AQM based on abstract numbers, rather than real-world impacts. A second reason may lie in the absence of ‘people’ in models and scenarios used to estimate and predict air pollution concentrations. For example, these models represent the flows of cars along roads, and it requires a great leap of imagination to link these to the reasons for actual journeys that people make. The modelling of emission sources, not the human activity that results in them, leads to a bias in policy that focuses on mitigating emissions through technological change, not through human behaviour, and a reliance on technological innovation not social innovation.

Methodology and Results
The paper will illustrate this argument through a discussion of methods and outputs from a range of projects including:

- the EPSRC funded Disruption project which examined low carbon mobility (www.fleximobility.solutions);
- the EPSRC funded MOT project which has provided a new approach to attribution of emissions from point-of-use to vehicle owners;
- work being undertaken to support distributional impact assessments for three of the UK’s proposed Clean Air Zones;
- The EU H2020 ClairCity (www.claircity.eu) project that is working with citizens to develop city policy scenarios that meet both air quality and climate change targets, and fulfil citizens’ requirements for a high quality of life.

The methods employed vary from detailed data analysis and emissions calculations for over 30 million individual vehicles in the UK (MOT), microsimulation of behaviour to drive air quality modelling and source apportionment (ClairCity), focus groups and long-term social ethnography (Disruption), literature reviews and citizen and stakeholder engagement (ClairCity).

Conclusions
It has become clear that the tight focus on controlling exhaust emissions from cars has failed and will not be resolved in the near future. Also, there is a pressing need to align air quality management with other environmental (e.g. climate change) and health (e.g. obesity) challenges. To properly understand how to reduce polluting activity, we need to much better engage with why people appear to be locked into activities that pollute.

Acknowledgement
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Fig.1 Differences between NO₂ concentrations, and NOx emissions allocated to vehicle keepers (RAC, 2017)

Fig.2 How activity determines time and mode of transport and therefore emissions

References:
Putting People at the Heart of Air Quality Management

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What this is about....

• 20+ years of Air Quality Management policy have still left many areas of Europe with polluted air

• There has been a lack of interaction between AQM research, policy and practice and the social sciences

• The work presented here makes a significant advance in two key elements:
  • It moves beyond many conventional approaches to behaviour based on individual choice
  • It integrates social science with quantitative aspects of AQM

• The proposed social approach should be seen as *complementary* to existing AQM
Presentation

• A new approach to Air Quality Management

• Moving from “What and Where” to include “Who and Why”

• Why? The role of social activities

• Who? Differentials between the polluters and the polluted

• Summary
Air Quality Management vs Air Pollution Control

**Pollution Control** = Use of predominantly technical measures (cleaner technology/end-of-pipe) to control emissions from individual sources (stacks or exhaust pipes)

**Air Quality Management** = The control of diffuse sources to achieve reductions in ambient concentrations of pollutants – tackling cumulative problems

\[ \text{Emissions} = \text{Activity} \times \text{Emission Factor} \]
A new approach to Air Quality Management

WHO & WHY not just WHERE AND WHAT!

• Traditionally AQM has focussed very much on ‘hotspots’ where concentrations are highest = WHERE

• It also focusses on the objects that emit the pollution (e.g. cars, industrial plant, boilers etc.) = WHAT

We propose:

• Looking not at cars but at drivers/owners = WHO

• Apportioning emissions not by type of vehicle but by the type of journey being undertaken = WHY
Why is Pollution Created?

- We want to do the right thing but we can't!
- People create pollution, not technology!
- We need to see air pollution as a social problem.
- Behaviour, activity & practices.
Moving from **point of use**.....

...to **journey purpose**

![UK Transport Emissions Map](image)

**Figure 1.4: Domestic transport CO₂ emissions as carbon, UK, 2005**

**Figure 3.3: Estimated CO₂ emissions from all modes of passenger transport by journey purpose, GB, 2002/2006 average**

- **Commuting**: 24%
- **Business**: 13%
- **Other personal business/ escort**: 15%
- **Shopping**: 14%
- **Education/ escort education**: 4%
- **Visit friends at private home**: 13%
- **Other leisure**: 8%
- **Visit friends elsewhere**: 3%
- **Holiday/ day trip**: 8%

*Source: DfT analysis*

Activity Changes Through Day

The chart illustrates the proportions of observations by activity throughout the day. The vertical axis represents the time of day, starting from 0000-0300 and ending at 2000-2300. The horizontal axis shows the proportions of observations by activity, ranging from 0.00 to 1.00. The graph is color-coded to distinguish between different purposes:

- Discretionary
- Home
- Recreational
- Services
- Shopping
- Study
- Work

The data suggests that certain activities are more prevalent at specific times of the day.
Mode Changes Due To Activity

![Bar chart showing mode changes due to activity for Adam and NL, with activities such as work, study, shopping services, recreational, and discretionary, and modes including bike, car, public transport, scooter, and walking.](image-url)
The ‘Mobility System’

TRANSPORT System

COMMUNICATION System

ACTIVITIES
Work, Education, Caring, Eating, etc

Timing

Expectations

Location

SOCIAL Resources
Competencies, Social Networks, etc
ClairCity: breaking the traditional dichotomy

Policy

- NGOs
- Clubs, Societies
- Other Businesses
- Employers
- Service Providers
- Families
- Friends
- Households

Individuals

- Cultural Conventions
  - Expectations
  - Skills and ‘Know-How’

Land-Use & Zoning

Material Infrastructure

Objects and Equipment
Who is Creating Pollution?

- Looking at the “Polluter” not just the “Polluted”

- Who are the people driving the cars that cause the emissions?

- Do the people who cause the most pollution suffer from the most pollution?

- What types of areas lead to the most emissions?

- Are their social or structural reasons for this?
Total km Driven by Registered Vehicles (2011 - ‘000kms)

- 472 - 4205
- 4206 - 5388
- 5389 - 6348
- 6349 - 7178
- 7179 - 7914
- 7915 - 8714
- 8715 - 9635
- 9636 - 10821
- 10822 - 12761
- >12762

~35,000 areas
~700 households
~1600 people
~30,000,000 cars

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Exposure to NO$_2$ Concentrations

Mean Total NO$_2$ concentration per LSOA (µg/m$^3$)

% of Households in Poverty

NOx Emissions from Local Vehicles

Total private vehicle emissions (NO$_x$ (t) per LSOA)

% of Households in Poverty


http://dx.doi.org/10.2495/SDP160361
Office for National Statistics Output Area Classifications

<table>
<thead>
<tr>
<th>OAC Supergroup</th>
<th>Dominant OAC Group per LSOA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural Residents</td>
<td>1a Farming Communities</td>
</tr>
<tr>
<td></td>
<td>1b Rural Tenants</td>
</tr>
<tr>
<td></td>
<td>1c Ageing Rural Dwellers</td>
</tr>
<tr>
<td>Cosmopolitans</td>
<td>2a Students Around Campus</td>
</tr>
<tr>
<td></td>
<td>2b Inner-City Students</td>
</tr>
<tr>
<td></td>
<td>2c Comfortable Cosmopolitans</td>
</tr>
<tr>
<td></td>
<td>2d Aspiring and Affluent</td>
</tr>
<tr>
<td>Ethnic Central</td>
<td>3a Ethnic Family Life</td>
</tr>
<tr>
<td></td>
<td>3b Endeavouring Ethnic Mix</td>
</tr>
<tr>
<td></td>
<td>3c Ethnic Dynamics</td>
</tr>
<tr>
<td></td>
<td>3d Aspirational Techies</td>
</tr>
<tr>
<td>Multicultural Metropolitans</td>
<td>4a Rented Family Living</td>
</tr>
<tr>
<td></td>
<td>4b Challenged Asian Terraces</td>
</tr>
<tr>
<td></td>
<td>4c Asian Traits</td>
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<tr>
<td>Urbanites</td>
<td>5a Urban Professionals and Families</td>
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<tr>
<td></td>
<td>5b Ageing Urban Living</td>
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<tr>
<td>Suburbanites</td>
<td>6a Suburban Achievers</td>
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<td>6b Semi-Detached Suburbia</td>
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<tr>
<td>Constrained City Dwellers</td>
<td>7a Challenged Diversity</td>
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<tr>
<td></td>
<td>7b Constrained Flat Dwellers</td>
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<tr>
<td></td>
<td>7c White Communities</td>
</tr>
<tr>
<td></td>
<td>7d Ageing City Dwellers</td>
</tr>
<tr>
<td>Hard Pressed Living</td>
<td>8a Industrious Communities</td>
</tr>
<tr>
<td></td>
<td>8b Challenged Terraced Workers</td>
</tr>
<tr>
<td></td>
<td>8c Hard-Pressed Ageing Workers</td>
</tr>
<tr>
<td></td>
<td>8d Migration and Churn</td>
</tr>
</tbody>
</table>

60 Variables:
- Age
- Ethnicity
- Housing type
- Housing tenure
- Household composition
- Education
- Employment
- Health

8 Supergroups
27 Groups
76 Subgroups

Modal OAC used to classify LSOA (average of 3 OAs per LSOA)

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Emission Factors vs Distance Driven

Average Emission Factor (NOx g/km)

- OAC Supergroup
  - Rural Residents
  - Cosmopolitans
  - Ethnic Central
  - Multicultural Metropolitans
  - Urbanites
  - Suburbanites
  - Constrained City Dwellers
  - Hard Pressed Living

Annual km ('000s) driven per Household (with car)
Summary

- AQM has failed to achieve both high levels of public engagement or to address activity part of the equation: \( \text{emissions} = \text{emission factors} \times \text{activity} \)

- Social rather than technocentric and point-of-use approaches may help and should be *complementary* to current practice

- This will help to address the social and structural inequalities related to both the causes of air pollution and its impacts...

- And enable widespread emission reductions - not just hotspot management - linking to energy and carbon agendas and achieving a range of co-benefits
Thank You!

http://www.Fleximobility.Solutions
http://MOTproject.net
http://ClairCity.eu

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The work has been undertaken under EPSRC Grants EP/K000438/1 (MOT) and EP/J00460X/1 (Disruption) and has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement 689289 (ClairCity).

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